LIBRARY
FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS

VOLUME VI APRIL-JUNE, 1931 NO. 2

JOURNAL

OF THE

Pan-Pacific Research Institution

A Periodical Record of Investigations Bearing on Problems of Food Production, Distribution, Conservation and Consumption, as well as on Public Health, and Race and Population Problems as Related to the Countries Bordering on the Pacific.

THE PAN-PACIFIC AGRICULTURAL CONFERENCE - 2

THE BEACHES AT MISAKI - - - - - - - - 3
By Prof. A. S. Pearce,
Keiogijuku University, Tokyo

SUGGESTIONS FOR AN INTERNATIONAL MARINE BIOLOGICAL STATION AND LABORATORY AT HAWAII - - - - - - - - - - - - - - - 6

BREEDING TERRAPIN IN HAWAII - - - - - - 10

RESEARCH WORK AS A BUSINESS INVESTMENT - 11

THE ORIGIN OF "MARU" - - - - - - - - - 13

A PROGRAM AT THE PAN-PACIFIC RESEARCH INSTITUTION - - - - - - - - - - - - 14

AT PRESENT PUBLISHED QUARTERLY AT HONOLULU, HAWAII
BY THE
PAN-PACIFIC UNION

More frequent publication as acceptable material is contributed.

The Pan-Pacific Agricultural Conference

Two Pan-Pacific Conferences to be held in Honolulu during the fall months of 1931 have been postponed, the Pan-Pacific Agricultural Conference sponsored by the Pan-Pacific Union, and the Pacific Coast Foreign Trade Council meeting sponsored by the Honolulu Chamber of Commerce as a Pan-Pacific Commercial Conference.

The plan was to hold these conferences the one immediately following the other, so that delegates from far-off Pacific lands might attend both gatherings.

Owing to the fact that the National Foreign Trade Council holds its convention in Honolulu during May, 1932, it was felt that the two, the Pacific Coast Conference and the National, should be combined. At the same time requests came from about the Pacific that the Agricultural Conference be postponed for another year that the scientists interested might have further time for preparation and for the consideration of organizing a permanent Pan-Pacific Agricultural Association.

After much consideration the committee outlining the scope of the Pan-Pacific Agricultural Conference had brought it down to a minimum in the matter of consideration of subject, selecting

1. The Food and Population Problems of the Pacific,
2. The World's Rice Situation and Its Future,
3. Agricultural Science,
4. The Economic Region and Its Characteristics,
5. Plant and Animal Pests,
6. Soil Science,
7. A permanent Pan-Pacific Agricultural Association.

It is quite probable that a Pan-Pacific Fisheries Conference will be held separately from the Agricultural Conference, the delegates being housed at the Pan-Pacific Research Institution for a stay of several weeks.

The Director of the Pan-Pacific Union is now visiting the countries of the Pacific to confer with those interested in the conference. Whether it will be held in May, 1932, at the time of the Pacific Foreign Trade Council gathering in Honolulu, or at a later date more suitable to scientists is one of the questions to be determined.

In the meantime the topics mostly of interest at a Pan-Pacific Agricultural gathering will be discussed at the Friday night science gatherings in Honolulu, and a series of papers to be read at these meetings has been outlined dealing with Agricultural Science. The Friday popular illustrated science lectures in Honolulu are now given at the Pan-Pacific Clubhouse as a more central location, the buildings of the Pan-Pacific Research Institution being reserved for resident and visiting scientists engaged in research work, as well as for the junior scientists who are attending the University of Hawaii.

A series of exhibits, chiefly of Hawaiian and other agricultural exhibits, are a feature of the work at the Pan-Pacific Clubhouse, this in training and preparation for the miniature agricultural exhibit next year. Efforts will be made to get sample exhibits from all Pacific lands.

The Beaches at Misaki

By A. S. PEARSE
Keiogijuku University, Tokyo

The craggy cliffs and deep bays at Misaki make a magnificent setting for the Biological Station of the Imperial University of Tokyo. Their beauty has been long appreciated. At the most picturesque spots are to be found the moldering tombs of old daimios and the disintegrating remains of ancient castles. Professor Mitsukuri founded the station in 1887, a year before the establishment of the laboratory at Woods Hole, Massachusetts. The late Bashford Dean loved Misaki and built a cottage which still stands on a hill between two beautiful bays. The present director, Professor Naohide Yatsu, his assistants, Messrs. N. Yoshi and S. Kojima, and the veteran collector, Kuma-San, are very competent and friendly, so that work at the station is most pleasant and profitable. On the beaches are many unusual plants and animals; the plankton is very rich; and in the deep waters offshore are beautiful siliceous sponges, giant crabs, and other interesting types. The land at Misaki has been steadily moving upward for centuries. During the great earthquake of 1923 the whole shore line rose four feet in a few minutes. Today the remains of rock-boring clams may be seen well above the present high tide mark.

Misaki is a busy place. Fishermen of all types and degrees ply their arts alongshore. At low tide old women and mothers with their children wade about on the rocks seeking snails and edible seaweeds. Divers with goggles over their eyes plunge down for seaweeds and snails. Boats carry seekers for seaweeds, snails, fishes, shrimps, crabs, lobsters and devil-fishes back and forth. At times the aristocrats of all these, the open-sea fishermen, come ashore to dry and mend nets, sleep, gossip, wrestle, and feast. Octopi are caught by lowering earthenware pots to the bottom. The animals crawl into these, are drawn to the surface, and sent to market. Any fine day a hundred fishermen may be seen in front of the station—drawing up pots, seines, and trawls; diving, dipping, wading, and picking alongshore.

As on all ocean beaches, the animals at Misaki are arranged more or less in horizontal zones, but of course there are variations according to the degree of exposure to the open ocean. Most of the shore line consists of pitted, eroded volcanic rock which furnishes an abundance of lurking places for a variety of littoral animals. In the estuaries a beautiful, brown-mottled, rhizostome jelly fish, *Mastigias-papa* L. Agassiz, pulses gracefully through the water, and on the muddy flats alongshore there are myriads of elongate snails, *Batillaria multiformis* (Lischke), and two burrowing crabs, *Helice tridens tridens* (de Haan) and *Scopimera globosa* de Haan, scuttle about on the beaches. The males of the last species have a curious habit during the breeding season of waving both their large claws frantically up and down to attract the attention of the females. The whole beach twinkles. In the bays the stinging jellyfish, *Carybdea restonii* Haacke, is often a nuisance to bathers. Ctenophores at times occur in enormous numbers in littoral waters. In order to study the animals on the exposed rocky shores, the writer selected two stations which were typical. At Station I there was a narrow little bay and the rocks sloped gradually to the low tide mark. In the rough surface there were about twenty little pools which served as refuges for aquatic animals when the tide was out. The rocks at Station 2 extended abruptly to the sea without any appreciable slope, but were cut up by many canals and holes. During storms the waves did not roll over the beach, but

dashed high against the sea wall and sent spray far inland.

On the rocks above high tide mark, particularly in damp places, live two crustaceans that are of the seas yet have departed from it. The red land crab, *Sesarma haemotocheir* (de Haan) frequents the crannies on cliffs where there is a little seepage and also digs holes in clay banks. At night it often comes out to hunt for food. The isopod, *Ligia exotica* (Roux), is everywhere alongshore, running in and out of the water in great herds, but climbing high upon the cliffs when pursued.

Near high tide mark at the heads of bays a little snail, *Littorina brevicula* Philippi, clings to the rocks, but at points which are exposed to the open sea the rock barnacle, *Balanus trigonus* Darwin, is typical. On exposed reefs lower down this barnacle is accompanied by the spiny oyster, *Ostrea spinosa* Quoy.

Somewhat below Littorina but well above low tide another snail, *Monodonta labio* L., is at home and on rough, rocky surfaces nearer low tide the shelless snail, *Onchiduim verrucalatum* Cuvier, flourishes. Scattered about over the bare rocks in the tidal zone are barnacles, *Balanus trigonus* Darwin, *Mitella mitella* (L.), etc.; patelloid snails, *Cellana toreuma* Reeve, *Petalloida saccharina* L., etc.; several chitons, *Acanthochitea defilippi* Tap.-Can., *Ichinochiton coreanicus* Adams and Reeve, etc.; and three anemones, *Acanthopleura xanthogrammatica* (Berkly), *Sagartia leucolena* Verrill, and *S. nitida* Verrill.

Toward low tide mark occur several species of snails and clams, large and small. *Turbo coronatus coreensis* Recluz and *Thais bronni* Dunker are very common and during August the beautiful little eggs of the latter are to be found in pearly groups in holes and crevices. Another common mollusc is the octopus, *Polypus vulgaris* (Lamarck). The date shell *Lithophaga gracilis* Philippi, bores in the rocks. Where masses of the ubiquitous *Sargassum thunbergii* Kuntze or algae make a blanket over the rocks there are many crustaceans—copepods, ostracods, isopods, amphipods, and small decapods, especially little spider crabs. Under loose stones between tides *Sphaeroma oregonensis* (Dana) is abundant. The ramifying holes in the rocks are resorts for the little porcellanid, *Petrolisthes japonicus* de Haan, and for numerous clams, worms, sponges, and bryozoans.

The tide pools which contain algae harbor spider crabs, *Pugettia quadridens* (de Haan); shrimps, *Palaemon pacificus* (Stimpson) and others; portunids, *Charybdis 6-dentata* Herbst, etc.; fishes, chiefly gobies; and sea urchins, *Heliocidaris crassispina* (A. Agassiz) and *Strongylocentrotus pulcherrimus* (A. Agassiz). Among the brown seaweeds there are eels, *Dictyosoma burgeri* Van der Hoeven, and a little goby (*Luciogobius* sp.) which matches them closely in color. The latter clings to the fronds by means of a ventral sucker. The species of hermit crabs, as is usual, show segregation into rather definite zones. *Pagurus samuelis* (Stimpson) is found almost everywhere in pools between tides; *Pagurus lanuginosus* de Haan occurs from half tide to low tide mark; and *Clibanarius bimaculatus* (de Haan) is found at low tide mark and immediately below.

Besides the more or less sessile inhabitants of the beaches, there is a hungry army which marches up and down with each tide. The two small gobies, *Chasmichthys dolichognathus* (Hilgendorf) and *C. misaki* Jordan and Snyder, are found everywhere. They inhabit the smallest rocky pools and creep up on the very forefront of the advancing tide. The large isopod, *Ligia exotica* (Roux), follows the tide back and forth and is apparently at home in or out of the water, though it is usually seen in the air. There are four species of crabs which move up and down with the tides and each follows its own route: *Pachygrapsus crassipes* Randall is found where waves beat on ex-

posed reefs; *Sesarma pictum* (de Haan) prefers sheltered situations and *Hemigrapsus sanguineus* (de Haan) and *H. penicillatus* (de Haan) are usually found beneath boulders or in crevices.

There are some insects and mites on the beaches at Misaki which have come from the land to invade the sea. A little red mite (*Eupodidae*), swarms on the rocks near low tide mark, especially where there is a covering of algae. An apterous insect *Axelsonia nitida* (Folsom) and a wingless beetle (*Staphylinidae*) are common in crevices on the lower beach. Little water striders, *Halovelia septentrionalis* Esaki, are very common. They hide among the algae or float, like bits of soot, on pools and quiet bays. A tipulid comes on fine days to lay its eggs along shore at low tide.

A little mosquito, *Aedes togoi* Edwards, breeds in pools at high tide mark and above. The larvae and pupae of this species are remarkably resistant to variations in salinity and have considerable ability to endure high temperatures. In order to study the conditions under which these lived, four pools which were less than a foot in depth were selected at Station 2 (see picture). Pool 1 was six feet long, three feet wide, and about three inches deep. It was sometimes invaded by the highest tides and during rains was diluted by considerable quantites of fresh water. It had a sandy-muddy bottom and contained myriads of mosquito larvae and two species of crabs, *Sesarma pictum* (de Haan) and *Goetice depressus* (de Haan). The latter crab daily walked over the bottom and by nipping upward with its large claws caught mosquito larvae, which it devoured. Pool 2 was about ten feet square. It was a foot or more below water every time the tide flowed, but it was only four inches deep at low water. It contained snails, *Monodonta labio* L., *Batillaria multiformis* (Lischke), *Tais bronni* Dunker, *Turbo coronatus coreensis* Recluz; the hermit crab, *Pagurus samuelis* (Stimpson); the crab, *Goetice depressus* (de Haan) which commonly lurked at the mouths of rocky holes and used the long setae on its maxillipeds as mobile fishing nets; and the goby, *Chasmichthys dolichognathus* (Hilgendorf). After September 3 *Halovelia septentrionalis* Esaki entered this pool. Pool 3 (4 ft. square; 4 in. deep) was not flooded at every high tide, though it was close to the sea. It harbored about the same animals as Pool 2 and also the comparatively sessile snails, *Petalloidea saccharina* L. and *Cellana toreuma* Reeve. Pool 4 (6 ft. square; 8 in. deep) was the highest of all. It received water, as waves or spray, from the ocean only during storms, and during rains received little fresh water as it was situated on a rampart and had high, nearly vertical walls. Its water was green with algae and the only animals present were mosquito larvae; crabs, *Sesarma pictum* (de Haan); and, at the beginning of the observations, one young fish, *Atherina* sp. Two of the four pools observed contained mosquito larvae (1, 4) and the other two (2, 3) did not. The temperatures and salinities in these four pools at various times are given in Table 1. Mr. Kojima kindly allowed the writer to examine his records for the temperatures and salinities (by silver nitrate titration) during the time of the writer's studies. His observations were made daily over the sea wall at Station 2 at 10 A. M. The maximum and minimum temperatures recorded by him during August were 28.8° C. on August 7 and 24.7° C. on August 26 and 30; salinities, 34.42 on August 4 and 32.22 on August 19. In September, up to the time the work was discontinued on September 6, the figures were: temperatures, 25.8° C., September 1; 23.5° C., September 5; salinities, 34.05, September 2 and 33.77, September 5. It will be observed (Table 1) that the salinities in Pools 2 and 3, which had close connection with the ocean and contained no mosquito larvae, were quite similar to those in the ocean. On September 4, which was a clear, sunny day

with a moderate wind, the salinity in Pool 2 at 8 A. M. was 33.06 and at 3:10 P. M. when the rising tide entered the pool, 34.34. At the latter time the salinity of the rising ocean was 33.33. During seven sunny hours evaporation made a change of 1.30 in the salinity of this shallow pool, the bottom of which was of clean rock. The mosquito larvae and pupae and the crabs in Pools 1 and 4 endured temperatures as high as 34.1° and 35.6° C. and lived in salinities which varied between 16.30 and 23.40 and 34.69 and 43.18.

A considerable series of temperatures was taken (a) on rocks beside intertidal animals which were exposed to the full sun and (b) in crevices and under boulders where crabs, sponges, snails and other animals were sheltered. The former ranged from 31.2° to 35.3° C., and the latter from 27.9° to 31.4° C.

The foregoing account is largely descriptive and gives a very superficial survey of the beaches at Misaki.[1] It is intended to give some idea of conditions on these wonderful rock shores and, it is hoped, may lead others to take advantage of the opportunities there. There is usually an abundant animal population on wave-swept, rocky marine beaches. Such animals depend for food, directly or indirectly, on the inexhaustible resources which the tides bring in from the sea as small particles and upon the flotsam which accumulates at high tide mark. They must be able to resist wide variations in the environment—beating waves, changing salinities, temperatures, and feeding periods. Most of them have hard protective coverings and many are firmly attached to the rocks. An animal on a rocky shore leads a hard life, but there are compensations and advantages. Certain mites and insects which had attained life on land have returned to these rocky shores. Such a situation anywhere is a place of beauty, romance, and scientific opportunity. Among all the rocky shores on the earth those at Misaki are exceptional.

[1] Thanks are due to the following persons for identifying specimens: Mr. F. W. Edwards, mosquitoes; Prof. T. Esaki, halobatids; Dr. H. E. Ewing, mites; Dr. J. W. Folsom, aptera; Dr. M. J. Rathbun and Dr. Waldo Schmitt, decapod crustaceans; and Mr. M. Kato, molluscs. All specific gravities were determined with three Greiner hydrometers which measured 3 mm. in diameter. These were washed with alcohol, wiped and dried before each determination.

Suggestions for an International Marine Biological Station and Laboratory at Hawaii

It has been suggested recently at the Friday night science suppers that an International Marine Biological Laboratory be established on the grounds of the Pan-Pacific Research Institution, a laboratory entirely independent of any one government of the Pacific.

The discussion was an interesting one, and it is hoped may result in the creation of such a laboratory. Always the buildings of the Pan-Pacific Research Institution are at the service of scientists who wish to remain for a while in Hawaii for useful research work. For two months or more Dr. David Starr Jordan and a dozen leading ichthyologists from Pacific lands were guests of the Institution, and then began the work of making a check list of the fish of the Pacific, now being published in the Journal of the Pan-Pacific Research Institution.

Plans are now on foot to have as guests at the Institution fishery men and ichthyologists from several Pacific lands. They will be house-guests at the Institution for some months. Perhaps during their stay may be laid the foundation for a real internationally owned and supported ma-

rine biological laboratory at the crossroads of the Pacific Ocean.

The following remarks are from the shorthand notes of a round table discussion at the Pan-Pacific Research Institution. The names of one or two of the scientists participating in the discussion are omitted at their request.

A Scientist: At the Outrigger Club several of us had a point under discussion which was bringing scientific men together through the area of the Pacific and it occurred to me men in scientific lines might appreciate the opportunity of working, and associating for a short period of time, with other men working on related or similar problems. Institutions and laboratories of that kind here would bring men from different institutions for short periods to carry on investigations and meet other men also conducting investigations on their problem.

It occurred to me that these islands would be the logical place to have a center of that kind. I mentioned it to the Director of the Pan-Pacific Union, and he seemed to think it would be a very fine idea. I feel the location, climate and general characteristics of these islands would be ideal to work freely. It would not be necessary to be identified with any particular government, but purely for scientific study, and that is the question we discussed.

The Director of the Pan-Pacific Union: I would like to say that at present, from time to time, we have people studying here, and we give them accommodations on the ground, and they work in laboratories all over the island, but I think if such a laboratory as suggested could be established, we could turn this big house over to the bachelors, and the other buildings to the married men. If we had a place of that kind, Dr. Galtsoff, who has just returned from his survey of Hermes Reef, for instance, might stay for a year instead of a little while, because I imagine there are certain things in the tropical waters you people might be glad to work on, which you could not get where you have two seasons.

Dr. Paul S. Galtsoff: (U. S. Government Fisheries Service, Washington, D. C.) Yes, there are the coral reefs. But all work in the seas is expensive. It is the most expensive science of all. There is the necessity for boats, among other things.

Mr. Edwin W. Bryan: (Assistant Director of the Bishop Museum) I can only speak for myself and not for the Museum, but I think this idea has been coming up for the past twenty-five years, of a marine and tropical laboratory. Perhaps you remember my namesake, (William A. Bryan) who had a very elaborate idea worked out. I do not know why it did not go through.

The Director: Perhaps it might be worked out; for instance, our plans for a Pan-Pacific Botanic and Acclimatization Garden are to have all the different kindred associations about the Pacific nominate the directors, and have it conducted as a joint affair, not under the Pan-Pacific Union, not local or American, but the American scientists appointing one director, the Australians another, the Chinese another, and so on; the directors to raise the finances and then appoint the workers. It may be a difficult thing, but I feel the Pan-Pacific Acclimatization Garden is going to become a reality.

If we had such a laboratory as has been suggested, could it be accommodated on our seven acres?

Answer: The laboratory would not require very much space, but a lot of money for equipment.

Dr. Galtsoff: A small laboratory, for instance a marine laboratory, which is expensive because it involves the laying of lead pipes, pumps, pressure tanks, to accommodate about 15 or 20 investigators, would cost probably $150,000.00. That was the item worked out for the proposed Bermuda Biological Station.

Director: The upkeep would probably

amount to $40,000.00 or $50,000.00 a year.

Dr. Galtsoff: The upkeep for the laboratory is not so costly but the upkeep for the boat is.

Director: I wonder what is the annual investment at Woods Hole.

Dr. Galtsoff: It is difficult to tell; I know that the supply department of the marine laboratory which catches fishes and sells them to the institution for dissecting, and also collects specimens, does business to the amount of $200,000.00. The land was granted, and the buildings erected by Mr. Crane and Mr. Rockefeller.

E. M. Ehrhorn (Entomologist): Dr. Mortonsen passed through here several years ago. He said this place was one of the most feasible as a biological station. When Dr. Jordan was here I told him I thought it would be feasible for all universities and scientific institutions about the Pacific to contribute annually toward a station in these islands, and he too, thought it was a good idea but that we would have to make the first move. My thought was that Stanford, the University of California, University of Melbourne, and so on, would all combine and contribute a certain sum annually, with the privilege of sending a number of their men in certain seasons to study our fauna and then the material which would be collected and distributed about the Pacific.

Director: That might be done. Dr. Ishikawa is again coming here from Japan and in that case Stanford will send Heree from the Philippines. Gilbert Whitley, ichthyologist, is coming from Australia and they would be here for some time. I want Hugh Smith, also, from Siam. If we had O'Malley, (Fish Commissioner of the United States), Hugh Smith and the others, I think it would be a good thing. I would like very much to have you write me a little article, suggesting that we have a Conference on Marine Biology and a biological station be started.

Mr. Ehrhorn: It is not only specimens but a question of study; some specialists might make a thorough study, then the material which could be gathered up could be used all over, and we would be in exchange with all places. It would not be necessary for a man studying to go to Australia. The material would be here, but the thing he is studying would be given to all other institutions.

Dr. Galtsoff: The difficulty seems to be that the American institutions, especially universities along the Pacific, have a tendency to have marine stations of their own. Nothing can beat Puget Sound as a collection ground, and I have heard that the University of Oregon is building a station somewhere. The University of California certainly maintains her station. Stanford has Pacific Grove. It is hard to expect that these institutions will scatter funds to support something new when they have their own.

Mr. Ehrhorn: In those sections they are dealing with colder climates and the tropics are left out. The idea would be to collect and study our growth here.

Mr. Bryan: You will find exactly the same situation, I think, in marine as in insect fauna. It is specialized. I have heard a great many people say that if they were going to establish a tropic laboratory they would establish it in a tropical place, and not in Hawaii. I have also heard a number of people say the reef life in Fiji or Suva is better than here, and an even more ideal place would perhaps be Papeete, if you could get suitable arrangements there. The land fauna here is specialized, and the marine no better than elsewhere and one could do so much more if really down in the tropics.

Scientist: It seems to me, if we are going to have a laboratory where men could get together to conduct biological investigations which would interest scholars all around the Pacific, not so much for the study of faunas, that this was probably as central a locality as could be obtained anywhere. This would be an

ideal place for the study of organic evolution. Here you have a living laboratory. Mountains to the sea—that is certainly a fruitful field of study.

Dr. Galtsoff: I agree. Modern biology is not theoretical. Nobody in America would be impressed by the idea of collecting specimens, because that could be done, probably, in a specialized place. In modern laboratories the question of abundance of fauna is not of such great importance. There is one advantage here, the short distance to the greater depths. This must not be overlooked. Very few places are known where you can get to a depth of two or three thousand fathoms two or three miles from shore. A laboratory of this kind could be utilized by men working in all different fields.

Otto H. Swezey (Entomologist): One phase came up recently, that there are all kinds of laboratories here now in which research work is going on, and in which visiting scientists could work. At that time it was thought it could be made the headquarters for various kinds of research work which might be carried on in the laboratories rather than organizing and getting up new laboratories and running them.

Kilmer O. Moe (Agriculturist): I think that is the impression around the Pacific, that we have those facilities and it is a good place to come to. The Dutch and British will tell you that. One thing they look forward to is coming to Hawaii, where these things are centered. I believe myself that the work done here in sugar is of a very high grade, as well as the work done in pineapples, and the work done in the Museum is splendid. There is no question but that we have many facilities, perhaps more than many centers. It seems to me we should use these facilities more, and that they will be used if the visiting scientists come.

Mr. Bryan: We got together an informal committee at one time and were working on a plan to gather data on just what facilities we had, how many people could be accommodated, what the apparatus was, and how welcome they would be. I think one of the most important things is the library.

Mr. Bryan: From the standpoint of the Museum, we have two fellowships of two thousand a year available for scientists who want to come to Hawaii and the Pacific area and work on Pacific problems. Whether the Museum would like to go farther and chip into the general scheme I cannot say.

Mr. Swezey: How about the sugar planters? That is a commercial organization but if guest scientists come along we let them work.

Mr. Bryan: The men who have been here to the Science Conference all know there are facilities here; they go back to their individual countries and spread the news, and they, and their friends, come back to study.

Mr. Swezey: I have in my files a list of entomologists who want to come to work but they want a salary with it.

Mr. Bryan: The minimum you can get scientists for is something over a thousand dollars. They must have some stipend to keep them going. We had four scholarships of $1,000.00 each, but had to reduce it to two of $2,000 each.

A Scientist: The type of man we want would not ask anything at all. Two men I know are going to Europe to work in laboratories if they can get the opportunity to live there. There are a great many men like that, but we must have the thing that attracts that kind of man.

Mr. Bryan: If a man is willing to pay his own expenses, there is always a place to work, the Museum, the University and if he were a medical man I am sure Queen's Hospital, but if the University of Hawaii were to advertise that, it would be said to them, "What are you spending money for on scientists from Fiji, Australia, Japan, and so on?"

A Scientist: That is the reason why, if anything develops it should have finances outside of individual control.

Breeding Terrapin in Hawaii

A bit of scientific work in the breeding of turtles and terrapin is being carried on in Honolulu by Northrup Castle, Jr., for several years a member of the Junior Pan-Pacific Science Council. Young Castle is still attending the University, but since the age of seventeen he has been collecting turtles and terrapin for the purpose of scientific study.

On Pacific Heights, back of Honolulu, Castle has built a number of large tanks, and it is here that his experiments are being carried on. He believes and seems to be demonstrating that, while it takes the terrapin on the mainland (with our American winters) some dozen years to come to maturity, in five years from the egg in Hawaii (with no winters to intervene) the terrapin reaches its full size and growth.

As the Virginia terrapin has a commercial value of thirty cents before maturity and a value of eight or ten dollars at maturity, the saving of seven years in the raising of terrapin seemingly gives a tremendous commercial advantage to the breeder in Hawaii.

At present the Virginia terrapin is barred from Hawaii, as it is supposedly a devourer of small fish, although this is questioned. However, young Castle is experimenting with the Carolina terrapin, which is admitted to the Territory.

Samuel F. Hildebrand and Charles Hatsel have made a study of Diamond-Back Terrapin Culture at Beaufort, North Carolina. In reporting to the United States Government they say:

Five varieties of diamond-back terrapins are recognized as occurring along the Atlantic and Gulf coasts of the United States, as follows: The Carolina terrapin (*Malaclemys centrata centrata*), with a range extending from central North Carolina to Florida; the Chesapeake terrapin (*M. centrata concentrica*), which occurs in Chesapeake Bay, southward to the North Carolina sounds and northward to Buzzards Bay; the Florida terrapin (*M. pileata macrospilota*), along the Gulf Coast of Florida; the Louisiana terrapin (*M. pileata pileata*), which inhabits the coast from the mouth of the Mississippi River eastward to Florida; and the Texas terrapin (*M. pileata littoralis*), which occurs along the coasts of Texas and outlying islands.

The experimental work at Beaufort has dealt with only two of the five varieties of diamond-back terrapins, namely, the Carolina and Texas varieties. However, it is believed that results would have been essentially the same with other varieties, and we know of no reason why terrapins could not be bred in many localities along the Atlantic and Gulf coasts of the United States.

Diamond-back terrapins inhabit the salt and brackish marshes near the coast and in former years were very abundant. In more recent times, however, they have come to be regarded as one of the greatest delicacies known to connoisseurs, and the demand for them has led to such persistent overfishing that a marked diminution has resulted. It was thought by some people that with the passage of the eighteenth amendment to the Constitution diamond-back terrapins would become almost worthless. However, this did not prove to be the case, as first-class Carolina terrapins, measuring 6 inches in length on the plastron, or lower shell, sold at about $30 a dozen, and larger ones brought more in the markets on the coast of North Carolina in 1923. Since that time the State of North Carolina has prohibited the fishing for diamond-back terrapin for a period of five years. Chesapeake terrapins generally have commanded a higher price than Carolina terrapins, whereas the Florida, Louisiana, and Texas terrapins have sold for less.

Realizing that these valuable animals

were doomed to an early extinction, or that, at least, their numbers soon would be so reduced that fishing for them would not be remunerative, the Bureau of Fisheries, as long ago as 1902, began experiments in breeding them in captivity. Private individuals already had made attempts to do the same thing, and some of the more persistent ones had reached some measure of success. Their methods, in some cases, were radically different from those that have been worked out by the bureau and, on the whole, are believed to be less satisfactory. In the bureau's experimental pounds at Beaufort, N. C., there are now, besides the original lots of adults secured for breeding purposes, several thousand terrapins of various ages that have been hatched and raised in confinement. In addition to these, thousands have been liberated or distributed to other places for experimental work. The females of the oldest brood on hand, that of 1909, as well as some of the brood of 1910, reached marketable size and produced eggs for the first time in 1915. Later broods have reached maturity in an equal length of time.

The data that have been obtained lead to the belief that terrapin farming can be made a profitable business, and it is believed, also, that the rehabilitation of the terrapin fisheries can be advanced greatly through the artificial propagation and liberation, in suitable areas, of young terrapins. It is the purpose of this circular to set forth as plainly as possible the methods followed at the Beaufort (N. C.) laboratory and which are yielding good results.

Briefly stated, the requirements of a terrapin farm are (1) a suitable inclosure in which a considerable number of adult terrapins can live comfortably, be fed, and supplied with a safe place for laying their eggs; (2) separate inclosures for the young terrapins; (3) a building that can be heated during the winter months in which the young of the year can be housed. The character of the inclosures and buildings and the management of the stock of adults and young are of such importance, however, that the various points must be taken up in detail."*

* See Economic Circular No. 60, U. S. Bureau of Fisheries.

Research Work as a Business Investment

Today not only the "Science" Journals point out the value of research work, but even industrial house organs spend large sums gathering scientific material for publication. The DuPont interests publish a house organ that is of a more or less scientific nature, and doubtless this great concern spends more money annually on scientific research than do most of our colleges.

To illustrate the value of some of the material gathered, we quote from J. H. Otterson in the DuPont Magazine on "The Money Value of Game":

"The wild life resource in America is worth millions of dollars. Increase it and you add to the nation's wealth," he begins. "Conservation of wild life in America, particularly of birds, has been urged largely on grounds of sentiment, with only incidental reference to the claims of sportsmen and farmers. Perhaps more general interest would be aroused in this movement and greater support would be gained for it by emphasizing the economic value of game.

"Louisiana produces more fur-bearing animals than any other section of North America. Pelts valued at nearly $6,500,000 were taken during a representative season.

"The state of New Hampshire has announced that its wild life resource represents an annual value of $6,500,000, which includes revenue from sportsmen and tourists.

"Kansas computes this resource at a figure of $10,000,000, with only a small allowance made for destruction of noxious weeds and harmful insects by insectivorous birds.

"Virginia conducted a survey two years ago to appraise its game bag. The Old Dominion has always been regarded as a good state for hunters, but would you believe that more than $1,256,000 worth of game was taken within its boundaries in one season? Yet that is the fact.

"North Carolina has an annual quail crop, figured at thirty cents a bird, of about $200,000. Considering other game taken, the total value reaches $1,000,000, and it is increasing slightly from year to year.

"The annual game crop of Pennsylvania amounts to an amazing total, representing a very large game bag; in fact, for 1927 it was over 11,414,000 pounds and contained among other items more than three million rabbits, one million squirrels, five thousand wild turkeys and fifteen thousand deer. Although no official estimate of the value of Pennsylvania's game bag has been made, undoubtedly the total would exceed $10,000,000.

"If one dared to compute from these figures the value of wild life in the entire United States, making due allowance for the greater productiveness of certain favored regions, the total would reach an incredible sum and would place this asset on a plane with other natural resources, such as forests, mineral deposits, oil, gas and the like.

"Moreover, in making the computation, it should be noted that with the exception of New Hampshire no allowance would be made of the tourist attraction value of game and fish. Nevertheless, such value does exist and it is of tremendous importance.

"Game birds and animals belong in the picture of the outdoors; they are of interest to young and old, rich and poor, at all seasons of the year. A fruitful source of revenue to any state is a plentiful supply of wild life, and it benefits all classes of citizens. Literally "the butcher, the baker and the candlestick maker' share in this wealth. Transportation companies, public utilities corporations, the automotive industries, merchants, farmers, hotel and camp associations, the building trades —in fact, almost all branches of business —are benefited by the wild life resource and the public interest therein.

"Is it not time we began to consider wild life as a wealth-producing asset, to be conserved and managed as industry looks after its own affairs? Restrictive legislation is only a small part of game management. Research is already showing how our existing stock can be increased. Most game species thrive and multiply when provided with a suitable environment, and the cost of producing game is of course lower than in other branches of industry.

"Wild life, considered from an aesthetic viewpoint, is well worth saving. But its economic value is so great that conservation work deserves the full support of all as one of the nation's greatest business enterprises."

Again quoting from the same publication, on "Organized Research," "The application of many minds to many puzzling problems smooths the way to their solution. Some years ago a prominent European business man completed an extensive tour through the industrial cities of this country and was on board the ship which was to carry him home when a news reporter espied him. Rushing up the gang-plank the breathless young man introduced himself and begged the privilege of asking a single question. It was this:

'What impressed you most on your tour?'

"And the man replied without hesitation, 'American genius for organization.'

"Times have changed. The inventive genius who labored alone in a garret and the scientist who sought seclusion in his back-yard laboratory belong to another

day and age. We like to remember that Ericsson began the construction of the screw propeller in a bathroom; that Whitney's cotton-gin was first manufactured in a log cabin; that parts of the first steamboat built in America were first set up in the vestry of a church, and that many a famous chemist was forced to preëmpt the use of the kitchen stove to carry on his experiments. But even though stories of work done in such environments still possess a lively appeal, and granting that individual scientists, working alone, may yet make discoveries and inventions of note, the fact remains that most developments of major importance today have their settingin the research laboratories of industrial organizations. In well-constructed buildings, designed especially for the purpose and equipped with everything that may be needed to carry on their work, large groups of chemists and physicists labor together on a great variety of problems, some of which require years of study and experimentation before they can be solved.

And curiously enough, modern research methods practically reverse the procedure followed by chemists of an older day. If some one accidentally or otherwise discovered a new material, the next problem was to find some practical use for it. Today, much research work starts with the need for some new or improved product and when the specifications are drawn up and carefully studied, sometimes for months, the big job is to find out how best to build it, first in the laboratory, then on a semi-works scale, and finally on a full-scale production basis. All this calls for organization of a kind undreamed of by chemical experimenters of a few generations ago.

The Origin of "Maru"

The word "Maru," commonly used with names of Japanese ships such as Shinyo Maru and Chichibu Maru, has been a constant puzzle to Americans.

There have been diverse views expressed by different authorities, and this subject has from time to time given rise to an animated discussion among students and laymen alike.

The matter is clarified in an article dealing with this subject, which appeared some two years ago in the Moji Shimpo, a newspaper published in Japan. The article was written by Enosuke Nakamura, and here is the author's explanation:

In Japan, from a big ocean-going liner to a small river craft, each has a name with the suffix "Maru." As to its origin and the base of its derivation, different views have been expressed by men of knowledge, thus:

1—According to an old legend, in ancient China, under the reign of the Emperor Kotei, there was a man by the name of Tai-to-shi to whom a messenger from heaven, called Ha-kudo-Maru, appeared and taught him the art of shipbuilding. Since then, ships are said to have been named with the suffix "Maru" in deference to the instructor.

2—In olden times in Japan, family names often had the suffix "Maru" appended, just as "ya" is added to names of business houses at present. This is said to be a derivation of the word "Maru" applied to ships.

3—To call a ship "Maru" is, according to the heavenly system, the same as to call the towers of a castle Hon-maru, Nino-maru, etc.

4—The name is derived from divination.

5—The Shrine of Shiga Myojin in Shigashima Isle in Chikuzen Province is dedicated to Akumo-gira-Maru, a deity supposed to live under the water. Suf-

fixing "Maru" to names of Japanese ships is due to reverence to this deity.

It is true that from old times, children (male) were often named with the suffix Maru, and the reasons for so naming are: first, it sounds very euphonious, having a sense of dearness in itself; secondly, Maru (roundness) is one of the shapes, much more symmetrical than a triangle or a square, and therefore beautiful; thirdly, Maru signifies harmony and possesses the meaning of encouraging the child's future braving of the difficulties of life and reaching the shore of success.

With the same intention it has been applied to the names of ships so as to soften their nomenclature. It also felicitates the future of ships, so that they shall ride over dangerous seas without mishap.

Thus "Maru" applied to a ship personifies it and felicitates its future. Contrary to the western usage of treating a ship as of feminine gender, the Japanese consider it as of the opposite sex.

Thus Japanese merchant vessels are now known by the term "Maru" all over the world and take a prominent part in the world's marine traffic.

A Program at the Pan-Pacific Research Institution

February 10, 1930

SPEAKERS:

Dr. Bruno Lasker of "The Inquiry," New York City;
Dr. Willis T. Pope, U. S. Agricultural Experiment Station, Hawaii;
Prof. Samuel Collins, Kamehameha Schools;
Dr. D. W. Lyon, Pan-Pacific Club of Shanghai;
Professor R. S. Bean, University of Hawaii;
Dr. Louis G. Carpenter, State College of Colorado.

The Inquiry, a new type of social education, was explained last Friday night at the Pan-Pacific Research Institution by Dr. Bruno Lasker, a member of its staff since 1923, formerly managing editor of The Survey. The Inquiry operates, in the main, through three forms of activity: research, the issue of educational literature, and coöperation with other agencies, local, national and international.

Some of the current projects being undertaken are as follows: "Business Looks at Itself," "Racial Factors in Industrial Life," "Employees Representation in Industry," "Key Ideas in Social Thinking," "Group Discussion in Social Education," "Methods of International Conferring."

In "Business Looks at Itself" groups of business men and teachers of business administration are coöperating with the staff of The Inquiry in building up a series of study and discussion outlines to help young business men and others in a self-examination of their attitude toward ethical problems. An example was cited of the question of taking double commissions, one from the purchaser as well as the seller, which in a number of business transactions is a considerable temptation. Another is the matter of taking employees from competing firms.

One of the most interesting published studies of The Inquiry is "Race Attitudes in Children," of which Dr. Lasker is the author. "The Fairfield Experiment," designed to ameliorate the sharp religious lines emphasized during the Hoover-Smith campaign, represents the suggestions to a Protestant group by an outstanding exponent of the Catholic faith as to how a better understanding between them might be arrived at. "Why the Church?" "And Who is My Neighbor?"

"Nationality, Color and Economic Opportunity in the City of Buffalo," "All Colors" (a study outline on woman's part in race relations) are titles of other interesting studies, all of which may be secured by addressing The Inquiry at 129 East 52d St., New York City. Established in 1922, The Inquiry, which is incipiently international, endeavors to study and adjust conflicts in all parts of the world.

The dinner discussion centered around two main points, Hawaii as a melting pot, and research in Hawaii. Dr. Willis T. Pope, who led the discussion, said:

"We hear much of Hawaii being a melting pot. This goes back much farther than the present fusing of human races. First it was a melting pot under the ocean, melting all material elements together, making the lava; then the eruption or formation of mountains, which 'melted' or disintegrated into soil, very rich soil. Now let us take the matter of plants. They come here and do their 'melting' or developing into new plants, until, when the islands were discovered, there was possibly the largest number of distinct flora of any spot in the world, at least of its size, and it was very far from any other land.

"When plants like the watermelon or avocado are brought here, it is not necessary to hybridise to get remarkable results; they mix naturally and the new hybrid is superior to any in the world. The term 'melting pot' is natural to Hawaii."

Among the guests was Professor Samuel W. Collins, new instructor in the Department of Animal Industry of Kamehameha schools. On the subject of "melting" Professor Collins said: "I happened to wander over here from California, where I was educated in a very cosmopolitan school. I will illustrate, with a little story, why I call it a 'cosmopolitan' school. On our football team, in 1893, we had on our right end a boy from Texas; on the left end a colored boy; a Jewish chap played halfback, and our quarterback was a lad almost completely American Indian. I could not quite appreciate the idea, when I first went there, of a colored man being on the football team, but after I saw him play, I could not, somehow, maintain my prejudice. Right across the hall, in Seena Hall, were two Jewish boys; they were in my own work in science, and in the competition they beat me pretty badly. In this cosmopolitan school I learned tolerance. I want to say that I don't think caste and color matter to men working in science. Hawaii is certainly the melting pot, the crossroads of the Pacific. Not only in commerce are these ideals carried out, but in all things, and I do not think there could be found, any place in the world, more liberality of thought and toleration than exist here."

Dr. D. W. Lyon, of Shanghai, a member of the Pan-Pacific Club of Shanghai, was then called upon. He said: "The Pan-Pacific Club of Shanghai holds weekly meetings; the average attendance at the luncheons is seventy-five, but when we have some distinguished guest passing through, it expands to two or three hundred, so you will see we have many fine Pan-Pacific 'get-togethers'; that organization is doing an unlimited amount of good to help us understand each other. The membership is most cosmopolitan. Five or six different racial groups are always represented. I feel, somehow or other, that we who live in these cities of many races could be constituted 'weavers of internationalism.'

"My particular work is with the Young Men's Christian Association. I had the honor of being the first 'Y' man to be sent from America to China, 35 years ago. I have seen the Y. M. C. A. movement begin and grow in China, until now it occupies a position of influence in China, among the many races of people.

"Just a word about the first word in the name Young Men's Christian Association. It is not compatable with the kind of hair I carry. In order to maintain the youth of the Young Men's Christian Association there is a rule that when a man reaches the age of 60 he must step out and let a younger man step up. I am soon

to celebrate that milestone in my career, but even though I do retire from the service of the Y. M. C. A. I do not expect to retire from the service of the Orient. I believe those who have had the opportunity of living among the Orientals have a permanent mission. It has been my special privilege, during recent years, to make annual trips to Japan and Korea, and I feel I am therefore a little more of a shuttle than before, and I hope I have been helping to weave something more useful than a mere cocoon.

"It is dangerous to start a Y. M. C. A. man talking about the 'Y,' but I would like to say that we began our work among the students. When I went to China, 35 years ago, only the young men were interested in the ideas and ideals of the Y. M. C. A., and only the student class. Most of the colleges and schools were Christian, under the missionaries. There were a few government institutions, however, and after we gained their confidence, they were glad to coöperate. Four locations, Hongkong, Shanghai, Nanking and Tientsin, were selected as being ready for what we call 'city Y. M. C. A.'s.'

"In these cities were a good many young men who had perhaps been members of the 'Y' in other countries, not all of them Christians, but at least friends of Christians. America helped by giving us money for the erecting of the buildings, and in paying the salaries of the Y. M. C. A. secretaries. As far as current expenses were concerned, it had to be self-supporting.

"We said to the Chinese—'If you want this Y. M. C. A. organization, O. K.; help us support it. Otherwise we will go elsewhere.' The money that came from America was on the basis of so many cents from America for so many from China. It was usually 'fifty-fifty,' but sometimes it was $1.00 gold for $1.00 Mex. We have begun a platform for learning coöperation and I think that is the lesson that China must learn.

"In the past even business has been conducted along family lines. In the Y. M. C. A. work, relations are criss-crossed and men from 50 families are thrown together, fused into one central, strong unit, which we call 'team play' in athletics, and in social activities. Many men have graduated from the 'Y' into government service. More than 50 former secretaries are at present connected with the Nanking government. Of course, our force is depleted faster than we can build it up, but we are glad to make the sacrifice.

"Dr. Pope explained the meaning of the word 'research' as going around in a circle, the older meaning being to look thoroughly again and again; the newer, simpler meaning, 'to search for the truth.' He said, 'There are two phases of research, looking back and looking forward. We look back to see what has been done—it is our book of instruction to see what has already been passed over; it helps us to understand the work ahead.' "

Professor R. S. Bean took up the subject of research as it applied to the teacher, whether the spontaneous work of the research worker was more valuable than that done under pressure. Dr. Louis G. Carpenter, for many years professor of scientific engineering at the State College of Colorado, said, in reference to this: "The mind of the research worker is something like the artist's, a creative mind. A man can't work by the clock in research, eight hours a day. In 20 minutes he might do more important work than, at another time, he could do in a week."

Next Friday night, February 14th, Nelson Tuitele will speak on "Samoa and the Samoans." The lecture will be illustrated by films made in the Laboratory of the Pan-Pacific Junior Science Council. The public is invited.